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The 1st International Kazakhstan Coal Methane Workshop in Almaty

Speech of Mr. E.A. Aliev,
Head of the Solid Fuel Office
of the Ministry of Energy and Mineral Resources of Kazakhstan,
dedicated to opening of the Workshop

Dear Ladies and Gentlemen, participants of the Workshop!

One of the topical issues affecting development of the fuel and energy complex of the country is issue of using non-traditional and renewable energy resources among those the most practicable is coal methane.

Integrated development of gas-bearing coal fields allows extracting and utilization of the largest energy resources – coalbed methane besides coal itself. It appears as the most accessible, cheap and ecologically clear gas fuel recourse of all known non-traditional ones throughout the world.

It has been proved while the many years' research, that Kazakhstan has huge reserves of coalbed methane and stays among the top ten countries regarding it.

The growth of Kazakhstan export opportunities allows significant increasing of oil and gas extraction and transportation to internal and international markets. At the same time there is a disproportion remaining in fuel infrastructure, when almost all the hydrocarbons deposits located at the western part of the county, majority of the industrial enterprises located in the central and eastern regions.

The program of the President and Government of the Republic of Kazakhstan on restructuring of the energy and heat industry requires attracting of large investments, which should be directed to resolve problems in the framework of the whole country.

In this connection, self-provision of the regions due to utilization of local energy resources, including non-traditional ones, gains on specific importance.

Among the industrial regions of Kazakhstan coal mining oblasts of the center and east could provide themselves with gas fuel due to development of coalbed methane reserves. First of all it concerns the regions of Karaganda and Pavlodar.

(*continuation at the page 2*)

Dear colleagues,

The 1st International Kazakhstan Coal Methane Workshop was held in Almaty in September 12, 2002.

This event had been planned by the Methane Center in order to convoke representatives of all parties interested in development projects on exploration, extraction and utilization of this large-scale environment-friendly energy resource at the territory of Kazakhstan.

In this light KAZMIN annual international exhibition and conference, organized by "Iteca" company, offered the excellent opportunity for implementation of the project, because representatives of commercial companies, governmental agencies, scientific organizations as well as international financial institutions usually participate in the conference.

We hope, that besides specific decisions, the workshop helped to attract as well attention of professionals as public attention to possible solutions for environmental, economic and social issues of Kazakhstan coal mining regions by means of utilization of coalbed methane as an alternative gas fuel on commercial basis as being done in leading coal mining countries.

In this issue of our bulletin we publish the main materials of the recent workshop.

The Methane Center expresses sincere gratitude to "Iteca" for joint organization of the Workshop and hope for the future fruitful cooperation.

Sincerely yours,

Methane Center

(continuation of Mr. Aliev's speech)

First of all the extracted gas may be used to supply Astana, the capital of Kazakhstan, industrial and energy objects of Karaganda, Ekibastuz and Pavlodar, located in immediate proximity of the gas sources. Short transportation distance (20-100 km) helps to avoid expenses for gas compression and high-pressure gas pipeline constructions that in turn should raise competitive ability of local methane in comparison to the imported liquid gas and other fuels.

Even partial conversion of Central and Eastern Kazakhstan energy industry from coal to methane should face direct economic and social effect at the first stages of the program implementation.

Objective prerequisites of the large-scale commercial extraction of coalbed methane are the huge gas resources of Kazakhstan coal deposits, high methane concentration in coal strata extension, and also number of big consumers not far around the extraction sites.

CBM geological resources of Karaganda basin exceed 550 billion cubic meters and Ekibastuz ones - 75 billion cubic meters.

It will provide large-scale methane production for 70-80 years while development up to the depth of 800 m. At increasing of the depth developed to 1200 m the methane resources will provide commercial production for more than 100 years.

Huge methane resources of the numerous coal deposits of Northern and Eastern Kazakhstan that haven't been sufficiently explored are seen as reserves for development in the future. By preliminary estimation they contain no less than 600 billion cubic meters of methane.

The estimated volumes of annual underground and open mining methane emission at the basins of Karaganda and Ekibastuz show that after a period of emission reduction in early 90-th, related to decreasing of coal recovery, there is an upturn trend of methane emission due to intensification of coal recovery may be seen for the recent years.

According to the conditions of Kyoto Protocol Kazakhstan has assumed obligations on mitigation of greenhouse gas emission.

Analysis of greenhouse gas sources shows, that among traditional ones such as coal combustion and gas emission while oil and coal recovery are dominating in Kazakhstan.

This research proved the necessity of activities related to mitigation of methane emission from coal mines and quarries. For example, the deeping of coal deposits development in Ekibastuz approaches the depth where methane contain raises in two times, that leads to increasing of methane emission to 1 billion cubic meters annually.

Successful implementation of coal methane recovery and utilization projects would bring solutions for a range of social problems.

The Ministry of Energy and Mineral Resources of Kazakhstan gives significant consideration in recent years to the issue discussed today.

In December 2001 there was a special technical meeting in the Ministry where was considered the first implementation stage of the Methane program, implementing by RGSP "Karagandalikvidshaht", RGKP KazNII BGP, Karaganda Technical University and OJSC "Karagandagiproshaht and K°".

This year the Institute of Economic Research of the Ministry of Economy works on development of the fuel and energy complex summary balance till 2015, which will serve as the basis for preparation and Government consideration of the "Strategy of the FEC development till 2015". It is desirable to include the opportunities of coal methane utilization to the FEB and FEC strategy.

E. Aliev

The Issues on Coal Methane Recovery and Utilization in Kazakhstan

Katherine Buckley, Office of International Affairs
speaking on behalf of Karl Schultz,
Team leader, CBM Programs
United States Environmental Protection Agency

Good morning. Karl Schultz of the Coalbed Methane Program at U.S. EPA was not able to be here in person to participate in this roundtable, but conveys his best wishes, and wrote this speech that I am reading on his behalf.:

Although I cannot be here in person to meet all of you at this roundtable, I am excited about the prospects this event has to stimulate more productive collaboration between Kazakhstan and foreign experts to identify better means of recovering and using Kazakhstan's significant coalbed methane resources. Working with the Kazakhstani and international companies represented here, EPA believes we will be able to together tackle and overcome some serious barriers to the development of coalbed and coal mine methane resources in Kazakhstan. Development that will have profound positive impacts on the domestic economy and environment and on reducing emissions of methane, a potent greenhouse gas that contributes significantly to one of the most serious threats to our global environment, climate change.

I hope in this short talk to make clear my conviction that coalbed methane development is a proven method to generate economic and environmental benefits at the same time.

But first, lets examine the problems we need to overcome.

A recurring issue throughout my career has been the costs to the economy of implementing environmental protection programs. Whatever country you're in - developed, developing, or transitional, governments are struggling with the challenge of ensuring environmental protection without having a negative impact on economic growth.

Many times environmental protection and economic growth are portrayed in an either/or fashion; you can have one or another, but not both.

The US EPA recognizes that Kazakhstan needs to achieve multiple social and economic objectives, and understand the real challenges you face in balancing multiple objectives and needs. We hope that you realize or come to realize that coalbed methane projects offer the opportunity to achieve multiple economic, social, and environmental objectives in a financially sound manner.

EPA has been working in the United States and in several different developing countries and economies in transition for the past decade to identify and develop profitable opportunities to recover and use the methane gas that otherwise would be vented to the atmosphere during coal mining. The reason we have devoted so much effort to this task is because the EPA and other U.S. agencies have been charged to identify and find ways to partner with the private sector and other governments to combat emissions of greenhouse gases.

Methane is the second largest source of greenhouse gases, after carbon dioxide, and is much more potent. EPA has also identified coalbed methane emission reductions as having immense potential because a project at one mine can have the same benefit on the global environment as removing one hundred thousand cars from the road.

EPA's wishes to help those of you who will play a role in developing Kazakhstan's CBM resources. I hope this roundtable will be an opportunity to understand better the emissions of coal mine methane in Kazakhstan, to identify the costs and the benefits (both environmental and economic) to put to use more coal mine methane and reduce emissions, and to work to help develop projects that can lead the way to the profitable use of coal mine methane. It is our hope that working together, these projects will bear fruit in significant international interest by the private sector in developing a resource that also brings with it very significant greenhouse gas emissions.

And clearly, development of this resource also brings great benefits to the coal mines and their workers through greater mine safety and productivity, the nation through the profitable development of a clean energy resource that gives business opportunities, jobs, and a cleaner local environment. Clearly Kazakhstan has vast natural gas resources – to the west. But the infrastructure to bring this to the large population centers of Karaganda, Astana and elsewhere in the east are lacking, while coalbed methane resources abound.

Coalbed methane is an excellent example of an approach that allows us to reject the either/or proposition. As I hope we can together demonstrate, environmental protection and economic growth can go hand-in-hand; you can have both. I thank you and look forward to many more years of fruitful cooperation, and hope that the papers read and the discussion they elicit will help further promote the development of coalbed methane resources in Kazakhstan.

Karl Schultz

About development prospects of "Bogatyr Access Komir" LLP

Valery G. Stratov
Deputy Technical Director, Prospective Development and Design, "Bogatyr Access Komir" LLP

Before November 1996 coal mines in Ekibasturz basin was developed by a single operator - GAO "Ekibastuzkomir". After the sale of Ekibastuz opencast mines' property complexes to foreign investors coal recovery in the basin is held by three operators: "Bogatyr Access Komir" LLP, RJSC "UES of Russia", and OJSC "Eurasian Energy Corporation". According to the agreement # 125 among RJSC "UES of Russia" and "Bogatyr Access Komir" LLP dated by 05.11.99, property complex owned by RJSC "UES of Russia" was transferred under the trust management of "Bogatyr Access Komir" LLP and currently hand in the long lease.

Prospective development works conducted for opencast mines of "Bogatyr Access Komir" LLP, completed by the company in 1998-2002, are called to solve the issues of rational use of the deposits' resources which are the sole property of the Republic of Kazakhstan, provision of the recovery volumes at the level of consumption, reservation of the energy coals' market by keeping the coal price at the competitive level, and generating the appropriate environmental solutions.

1. Mining and geological description of Ekibastuz coal basin. Ekibastuz basin is located in Pavlodar oblast of the Republic of Kazakhstan. The basin is crossed by East-Siberian trunk railway, which links it with Astana and Pavlodar cities. The motorway Astana-Karaganda-Pavlodar and channel Irtysh-Karaganda are located in immediate proximity.

Ekibastuz basin represents a skew trough, elongated to 12 km from north-west to south-east, with maximum width of 6 km. Tha basin is split into 12 exploration sites, where three opencast coal mines are under operation: "Severnyi", "Bogatyr" and "Vostochnyi". Reserves of the 11th site and deep horizons -200 below horizon are assigned as reserved.

The main production seams are seams 1, 2 and 3, with average capacity of 160 m and seam depth up to 700 m. Seam 4 has comparatively narrow capacity (average 17,6 m), high ash content (49,2%) and separated from seam 3 by dirt complex with capacity of 25 till 110 m.

Coals of the basin are bituminous, heavily mineralized, by the grade of metamorphism they are referring to the type KSN (coking, weakly metamorphized). Average ash content of coal by seams 1,2,3 varies from 31 to 40%, ash content of geological mine-run coal - from 35 to 48%. Ekibastuz coals have a rather low cost and range attractive consumer qualities. **The coals are low-sulfur, with low phosphorus content,** that predetermine a rather low content of them in the smoke fumes. **Ash** of all the three developed seams is **high-fusing,** that **eliminates slagging of heat units** while burning the coals. Working moisture content is very low (3-5%), that **eliminates** freezing of the coal while railway transporting in winter.

Ekibastuz basin mine-run coal geological reserves amount 12,73 billion ton (Table1), estimated by applicable standards (limiting ash content of coal complexes - 60%, minimal capacity of coal and dirt complexes recovered separately - 4 m) dated by 01.01.00.

Table 1.

Name	Mine-run coal geological reserves				
	total	including seams			
		1,2	3	1,2,3	4
Basin total	12,73	4,02	7,20	11,22	1,51
including: by open-cast mines to -200 m	5,93	2,04	3,29	5,33	0,60
out of them open mine "Severnyi" (sites 1,2,3,4, part of 9,10)	2,54	0,74	1,51	2,25	0,29
open mine "Bogatyr" (sites 5,6, part of 9,10)	1,71	0,55	0,85	1,40	0,31
open mine "Vostochnyi" (sites 7,8,12)	1,68	0,75	0,93	1,68	-
Deep horizons (below -200 m) and site 11	6,80	1,98	3,91	5,89	0,91

2. Predicted need for Ekibastuz coals at the internal and external markets. Ekibastuz coals actual production and supply volumes analysis shows their maximum levels in 1985-1990, when annual production run up to 88.6-78.8 million ton, coal supply to Kazakhstani consumers – up to 43.7 million ton, to Russia – up to 40.0 million ton a year. Recent years are defined with unstable demand and fluctuation of supply by years: totally - from 36.0 to 50.0 million ton a year, including Kazakhstan – 21.2 to 30.5 million ton, and Russia – 14.0 to 25.4 million ton.

Predictive developmental works on prospect Ekibastuz coals levels of consumption show a possible growth of consumption up to 67-72 million ton a year till 2015, including Kazakhstan – to 37 million ton, some regions of Russian Federation - 30-35 million ton annually (Table.2).

Table 2

Name	2000 in fact	2005	2010	2015
Kazakhstan, total	23,6	30,0	33,0	37,0
including: heat and power stations	22,1	28,5	31,5	35,5
others	1,5	1,5	1,5	1,5
Russian Federation, total	25,1	28-30	30-32	30-35
including: Ural region	17,4	20-22	22-24	22-27
Omsk region	3,9	4,0	3,70	3,5
others	3,8	4,0	4,3	4,5
Total	48,7	58-60	63-65	67-72

Ekibastuz coal local and external marketing id based on two thesis: 1) stabilization and growth of power and energy production in Kazakhstan for 30-40%, ratable growth of Ekibastuz coals' consumption by hot and power stations; 2) stabilization of Ekibastuz coal consumption in Ural and Omsk regions of Russian Federation at the level of 30 million ton a year. However, there are no long term agreements among suppliers of Ekibastuz coal and its consumers in Russia. So the forecast is tentative.

3. Evaluation of current production condition. Development work analysis for operating opencast mines of the basin shows, that current coal recovery is conducted by rotary excavators, capping with its storage - by single-bucket excavators. Coal delivery to coal gathering stations and capping removal to external dumps are conducted by railway transport.

Along with favorable mine and geological conditions, providing high economic efficiency of coal recovery in the basin, **the is also a number of serious technical problems** complicating operations at the mines:

a) Complicated seams' structure with amplitude of ash content fluctuation up to 40% requires **coal blending by quality** before shipping to consumers.

b) Occurrence of dirt partings with significant capacity (up to 4 m) inside seams predetermines **selective recovery** of coal and dirt complexes. It is practically impossible to separate dirt from coal due to its beneficiation because of the slight coal and dirt volume weights difference.

c) **Ekibastuz coals are very tough** by their physic and mechanical characteristics. It predetermines inevitability of big non-standard coal lumps output**.** Currently the problem is mostly solved by using rotary excavators equipped with lump breakers, however it remains actual while loading railway wagons by single-bucket excavators.

d) Coal loading of railway wagons by high-production rotary excavators directly in the opencast mines doesn't meet the **wagon loading accuracy** requirements (according to the standard overload of at most 2% permitted). Currently it's carrying out with less effective weight-metering complexes at the surface, which extend wagons' turnover time almost in 2 times.

e) Geometry of the deposit predetermines **continual deepening of recovery operations** from periphery to the center. Depth of the opencast mines "Bogatyr" and "Severnyi" is 200-210 m. Currently railway transport is used in both the mines. It is economically sound till the depth of 200-220 m.

f) Blending of Ekibastuz coal in stockpiles at the surface complexes (for example at "Vostochnyi" mine) is characterized by very **high dusting level,** which exceeds air pollution norms in hundreds.

g) Oblique seams attitude predetermines removal and storage of capping dirt to external dumps, which are a source of dust and noxious gas air pollution generated by uncontrolled endogenous fires and require large alienated lands at the surface.

4. Main directions of mines' prospective development. While determining the prospects for development of "Bogatyr Access Komir" LLP mines all the considered alternatives had to meet the following requirements:

1. Capacity of the mines, equipment productivity and capability of the transport schemes have to provide the necessary volumes of coal recovery.

2. Technical solutions for mines development have to provide retention of the Ekibastuz energy coals' market for a long term, due to:

retention of coal production cost for all the considered period, despite deepening of mining operations and increasing of capping ratio, at the level, which ensure keeping the coal price not higher than $ 3.5-3.8 per ton (free on rail);

increasing of Ekibastuz coals' consumer attraction by minimizing of II-nd quality group high ash content coals share in total volume of shipment.

3. The design objective was – to find appropriate solutions for improvement of environmental situation in the region. The solutions must provide significant reduction of dust and noxious gas emission to the atmosphere, minimize alienated lands for external dumps and occurrence of mass endogenous fires in the mines.

5. Main decisions on development of "Bogatyr Access Komir" LLP opencast mines.

5.1. Technical capabilities evaluation for mines of the whole basin shows that implementation of technical reequipment of "Bogatyr Access Komir" mines will provide the level of production required for supply Kazakhstani and Russian consumers with coals of Ekibastuz (Table 3).

5.2. It Is stated by **«Technical and economic assessment of conditions' parameters...»** (approved by a SCR (GKZ) protocol dated 02.11.01 # 120-01-K), that reduction of II-nd quality group coals shipping is possible only when changing the ash content conditions of seam 3 from 60% to 53%. Approximate basin coal reserves at transition to new conditions and transfer of seam 4 reserves to the category of underground mining are given in table 4.

As is obvious, in view of 67-72 million ton annual planned production the mines contain coal reserves for the whole term of contract operation.

5.3. Opencast mine "Boratyr". Mining operations development at "Bogatyr" will be conducted in operating technical limits on sites 5,6,9,10 till 2025 - 2030 with due regard to recovery in the most favorable synclinal part of the sites 5,9, with concentration about 600 million ton of coal and capping ratio – 0.35m^3/t.

Table 3
million ton

Name of opencast mine	1999 in fact	2000 in fact	2005	2010	2015
"Severnyi"	10.7	12,7	8	8	8
"Bogatyr"	17,1	23,1	32	37	40
"Vostochnyi"	11,1	15,9	16	18	20
Total	**38,9**	**51,7**	**56**	**63**	**68**

Transition to the new technology of production and capping operations with existing mining and transport equipment is conducted step-by-step, in period from 2001 to 2015:

- **At the 1st stage (2001-2003)** - increase in productivity of conveyor-railway complex of site 5 up to 14 million ton of blended coal per year;

- **At the 2nd stage (2003-2006)** – conveyorization of site 6 and increasing of quality blended coal production volume up to 21 million ton a year;

- **At the 3rd stage (2004-2010)** – construction of conveyor complex at the sites 9 and 10 with increasing of blended coal production up to 40-42 million ton a year.

Table 4.
billion ton

Name	Mine-run coal geological reserves				
	total	including seams			
		1,2	3	1,2,3	4
Total in the basin	11,79	4,02	6,86	10,88	0,91
including: opencast mines till -200 m	4,99	2,04	2,95	4,99	-
from them: "Severnyi" (sites 1,2,3,4, partially 9,10)	2,02	0,74	1,28	2,02	-
"Bogatyr" (sites 5,6, partially 9,10)	1,29	0,55	0,74	1,29	-
"Vostochnyi" (sites 7,8,12)	1,68	0,75	0,93	1,68	-
Deep horizons (below -200 m) and site 11	6,80	1,98	3,91	5,89	0,91

After 2015 – implementation of transition to fundamentally new technology of production and capping operations conducted with hydraulic excavators and auto-conveyor transport, constructing of blending-loading complexes inside the opencast mine and loading unit at the original ground for coal loading operations without wagons' uncoupling. Rotary excavators on production are replaced by hydraulic ones, and railway transport is replaced by quarry auto-transport of high carrying capacity. In addition, this equipment is accepted as unified as well for capping as for recovery operations with the purpose of maximal efficiency. **Transportation of capping dirt, mainly to the internal dump,** forming at the worked-out lands of synclinal part of sites 5and 9, is anticipated for the same period.

After 2030 – involving of stander part of site 10, and site 3 and partially 2 of mine "Severnyi" is required for compensation of withdrawn field of recovery operations in the syncline.

As results of development the technical and organizational measures **the main technical and economic activities of the mine "Bogatyr" have long-term sustainable prospects** in regards to the cost of production, working efficiency and coal quality that provides its competitiveness at the market.

5.4. Opencast mine "Severnyi". The considered and accepted way of the long-term prospect development of the mine is **reduction of mining operations' field** through temporal conservation of coal reserves of the sites 2 and 3 (in 2001-2007) and long-term **concentration of mining operations at the sites 1and 4,** with solution for the main objective – **prevention of an ecological catastrophe** in the region, related to the real danger of **large-scale endogen fires** at the mine and dumps. **In the period till 2015** it is planned to use the present mining and transport equipment: rotary excavators for recovery operations, single-bucket excavators at capping and dumps and railway transport for coal and capping.

Concentration of mining operations at the sites 1 and 4 with stripping ratio of 1.2 m^3/t **provides profitable coal production of 8 million ton per year,** at the price not exceeding $3.8 per ton. Contributing to provision of these figures **creation of temporary internal dumps** at the conserved sites 2 and 3 provides reduction of capping transportation distance in more than 2 times. Consequently, **creation of temporary internal dumps contributes to reliable isolation of superfluous field of recovery operations, withdrawal of the external dumps Severnyi and Zapadnyi and** considerable decreasing of dirt volumes placed at the dump Uzhnyi.

After 2015 – replacement of the present production and stripping equipment base by unificated base of hydraulic excavators and high capacity quarry auto-transport at the mine "Bogatyr". **The issue of coal blending at the mine internal blending storage is being resolved at this stage.**

To 2027 – the size of the temporary internal dump at the sites 2 and 3 inside the conservation zone will amount about 140 million m^3. Top of the dump will reach only the point of +110 m. Coal reserves will be completely developed in the synclinal part of the "Bogatyr" mine till that time. It will allow to use this free land for a constant internal dump. Start of reactivation of the sites 2 and 3 with progressive operations using flat-belt conveyors' system is planned for that period.

Table 5

Item name	Figures			
	2001-2010	2011-2020	2021-2030	2031-2045
Volume of production, million ton/year	32.0	40.0	40.0	40.0
including synclinal part	25.0	30.0	-	-
Volume of capping, million m^3/year	23.1	28.8	38.0	60.0
Stripping ratio, m^3/ton	0.72	0.72	0.95	1.50
Capital investments, billion tenge	18.9	23.2	15.0	22.5
million USD	126.0	155.0	100.0	150.0
Labor productivity at recovery operations, ton/month	677.0	947.0	1205.0	700.0

Table 6

Item name	Figures			
	2001-2005	2006-2015	2016-2025	2026-2045
Volume of production, million ton/year	8.0	8.0	8.0	8.0
Volume of capping, million m^3/year	6.0	9.7	9.7	22.0
Stripping ratio, m^3/ton	0.75	1.22	1.22	2.75
Capital investments, billion tenge	9.3	9.3	10.5	12.0
million USD	62.0	62.0	70.0	80.0
Labor productivity at recovery operations, ton/month	450.0	425.0	768.0	400.0

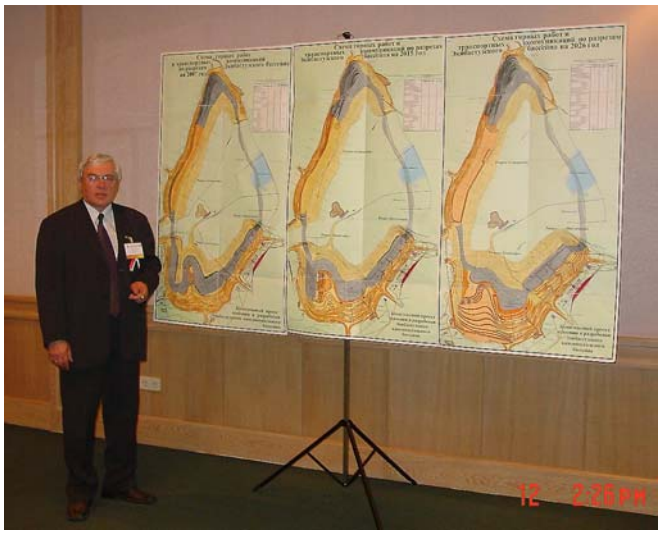
After 2027 – continuation of coal reserves recovery in the technical limits of sites 1, 4 and partially site 2 of mine "Severnyi" with capping storage in a permanent internal dump formed at the worked-out lands of sites 1 and 4.

5.5. Draining of the mines till complete recovery of the reserves provided by **underground drainage system,** constructed at the horizon –200 m.

5.6. Technical solutions, designed in the projects, provide a range of measures for air, water and land resources protection, and efficient development of the subsoil.

6. Technical and economic characteristics of the opencast mines.

6.1. It is planned to spend 57 billion tenge (380 million USD) for implementation of the abovementioned decisions on the mine "Bogatyr" during the period from 2001 to 2030. While this period the labor productivity will rise from 677 to 1205 t/month (in 1.8 times), production price for 1 ton of coal will remain at the level of 3.5 USD for the whole considered period, despite deepening of mining operations for 100 m, and increasing of the stripping ratio from 0.72 to 0.95 m^3/ton (Table 5).



6.2. Implementation of the decisions made for the main "Severnyi" for 2001-2025 period requires investment of 29 billion tenge (194 million USD). While this period the labor productivity will rise from 425 to 768 t/month (in 1.8 times), production price for 1 ton of coal after concentration of mining operations at the site 1 and 4 (2007) will remain at the level of 3-3.5 USD for the whole considered period (Table. 6).

Summary. Analysis of calculations and justifications made in the proposals shows that efficient utilization of coal of the unique Ekibastuz basin, provision of coal production at the level of demand and maintenance of coal production price at the competitive level are possible on the assumption of the abovementioned solutions' implementation.

In its turn the implementation of the proposed solutions will guarantee provision of the Republik of Kazakhstan with needful quantity of energy coals, for utilization by national consumers, and will allow to maintain the Ekibastuz coals' market for a long term to carry out coal export to Russian Federation. Increasing of the mines' production will results in rising of tax payments to the budget of the Republic and creation of new jobs, and formation of internal dumps allow to reduce negative effect to environmental situation in the region.

Valeryi G. Stratov
Presentation of development prospects for opencast mines managed by "Bogatyr Access Komir" LLP

Current situation and methane emission mitigation prospects at the mines of Coal Division of OJSC "Ispat Karmet"

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Alexander A. Shipulin, Mining engineer, Chief degassing and methane utilization specialist of "Spetzshahtomontagedegazatsyia"
Coal Division of OJSC "Ispat-Karmet", Karaganda

Karaganda coal basin is distinguished with high coal capacity of the deposit and appears as one of the most gas-bearing basins of the world. General expected reserves of methane are estimated at 3.5 billion m^3, and ultimate reserves at 1.8 – 1.9 billion m^3.

Karaganda basin coal mines develop rather high methane content coal seams disposed to sudden outbursts of coal and gas. One ton of coal recovery is accompanied by methane emission of 30 to 45 m^3 into worked-out galleries of the mines. Therefore a special attention while coal mining operations is given to mitigation of methane content is the mine air till safety concentrations and its further utilization. Technical Management of OJSC "Ispat Karmet" Coal Division and its specialized department "Spetzshahtomontagedegazatsyia" have deal with these issues in Karaganda basin. During the period of coal mining industry restructuring since 1996 underground mining decreased from 40 to 9.7 million ton/year, and absolute emission from 1.1 billion m^3 in 1992 to 336 million m^3 in 2001. 285 million m^3 of this volume is removed by ventilation devices and 51 million m^3 by degassing operations.

It must be noted that almost all known industrial methods of degassing are used in the mines in accordance with gas balance structure. Application of a complex of degassing methods (fig. 1) allows to provide sustainable degassing efficiency of 70-80% and to increase production of coalfaces to 10,000 ton per day. Due to the mentioned fact in 2001 two longwalls of Coal Division of OJSC "Ispat Karmet" came to the millionth point of coal production, and the quantity of operating longwalls was decreased from 33 in 1996 to 13 in 2001. Gas recovered by degassing facilities is used in boiler installations of the mines "Lenina", "Saranskaya" and "Kostenko", in the volume of 14.7 million m^3 a year or 28.8% of its capture, for heating the surface complexes and calorifer devices. Experience obtained in Karaganda basin and large methane reserves enable increasing the volume of its utilization. The Technical Management developed a program on recovery and utilization of coal methane at the mines of Coal Division for 2001 – 2005. The volume of methane recovered with degassing is supposed to be increased from 51.1 million m^3 in 2001 to 55 million m^3 in 2005 and its utilization from 14.7 to 22 million m^3 (from 28.8 to 40% of the volume recovered by this method) under the conditions of relatively stable coal production and gas content of the mines.

Since 1996 (establishment of the Coal Division of OJSC "Ispat Karmet") to 2002 degassing facilities have recovered 405 million m^3 of methane, and 70 million m^3 have been utilized in boiler installations of the mines (17.3% of methane capture). Minimum burning acceptable concentration of methane in the mixture – 25%, complexity of gas treatment from vacuum-pumping stations to consumers, dispersion of vacuum-pumping stations at the area of 2000 km^2 are main constraints for increasing of methane utilization.

At the same time another unsolved problem at Karaganda coal basin is the issue of ventilation methane utilization, which emission for 2001 estimated at 285 million m^3. Mitigation of this emission is not expected due to absence of an industrial technology for separation, enrichment and utilization, considering low methane concentration in the ventilation air. It is estimated at 0,07 – 0,53% at the mines of the Coal Division. Some developmental works on this issue are conducted in Canada and the USA. Moreover experimental installations for non-flame ventilation air methane oxidation in catalytic reverse – in-line reactor for concentration of 0.5 – 2.0% have been created in these countries. Mr. H. Saponjiev, a representative of canadian company "Natural Resources", requested the Coal Division in September 2000 with the purpose to determine conditions for application of their pilot plant for combusted methane concentration over 1.5%. We provided the company with parameters for mixing of ventilation and degassing methane for two mines of the Coal Division. However, we haven't been offered a specified proposition till present day.

Due to the imperfection of used degassing methane utilization method, related to the complexity of gas treatment, transportation to the boilers, dispersion of vacuum-pumping stations, and absence of a ventilation methane separation technology at the mines of the Coal Division, it is impossible to conduct additional utilization of more than 250 million m^3 of methane estimated to 2005 (equivalent of 500 thousands ton of coal). Thereupon, besides methane enrichment technology, consideration should be given to the issue of individual consumers not related to collection and long distance transportation of methane. In this connection partial utilization of ventilation methane (25%) and all the degassing methane may provide economic efficiency in the amount of more than 1.5 million USD annually. (Table 1).

Special attention at the mines of the Coal Division is given to preliminary degassing preparation of coal reserves with hydropneumatic treatment of coal seams through the surface drilled wells (GRP), according to the technique of Moscow State Mining University.

This method of degassing came as a result of our efforts for organization of large-scale coalbed methane production.

However, many years of its application under compliance of parameters for all known by us technologies does not provide minimal one-well recovery (over 5 m^3 per minute) for profitable production. This parameter in our conditions fluctuates within the limits 0.2 – 0.7 m^3/minute, that may be explained by rather low gas permeability of coal seams in Karaganda basin.

At the same time, long-term (5 – 7 years) development of GRP wells provides preliminary reduction of gas content in coal seams to 6 – 9 m^3 per 1 ton of reserves or 25-35% of the forthcoming gas content while their development. These results were achieved at the deposit of the mine "Lenina", when in 1993 – 1999 while mining operations in zones of 14 wells the tangible efficiency of preliminary degassing treatment in the sum of about 6 million USD was achieved due to reduction of development drifts' volumes, increasing of mining faces capacity and other activities to the connected to current degassing operations.

Table 1

#	Indicators	Unit	Annual volumes			
			1992	1996	2001	2005
1	Quantity of mines under operation, including mines of OJSC "Ispat Karmet"	pcs. pcs.	26 -	19 15	11 8	11 8
2	Underground mining	million ton	36.0	10.2	9.7	10.0
3	Absolute gas abundance of mines	million m^3	1016	463	336	275
4	Methane recovery: - ventilation facilities - degassing facilities	 million m^3 million m^3	 807 209	 408 55	 285 51	 220 55
5	• Methane utilization: • % of degassing volume	million m^3 %	- -	1.5 2.7	14.7 28.8	22.0 40.0
6	• Economic efficiency of utilization (in coal equivalent)	thousand USD		36.5	357.8	535.0
7	Reserve volumes of methane, including: - degassing with concentration of 25% and higher - ventilation	million m^3	253.0 33.0 220.0			
8	Foreign technologies employment prospects: - possible utilization of degassing and ventilation methane (25%) - economic efficiency of methane utilization	million m^3 million USD	82.0 1.6			

Advance degassing treatment works are conducted and financed by Coal Division of OJSC "Ispat Karmet". 15 GRP wells have been drilled and developed from the surface since 1997. These degassing wells are currently used for treating an especially outburst-dangerous seam D6 at fields of the mines "Lenina" and "Kazakhstanskaya" (Table 2).

Table 2

Mine	well #	Start of the development	Recovered			
			08.2002		since beginning of 2002	Since beginning of the development, thousand m^3
			Q of CH_4, m^3/minute	R, %	Q of CH_4, m^3/minute	
"Lenina"	15	12.1996	0.25	85	80.6	1725.7
	17	07.2000	0.18	85	69.0	247.1
	18	10.1999	0.23	95	88.3	453.4
	21	06.2000	0.25	95	75.8	231.8
	22	08.2000	0.20	90	81.7	265.7
	16	12.1999	Are kept under development in the filtration regime after hydro treatment		6.5	404.3
	19	01.1999			28.7	261.5
	20	12.1999			29.1	265.6
"Kazakhstanskaya"	23	10.2000	0.30	95	108.5	243.1
	24	09.2000	0.45	96	154.8	358.1
	25	07.2001	0.40	95	132.2	247.3
	27	09.2001	0.25	95	94.9	140.2
	26	12.2001	0.45	96	96.6	96.6
	28	08.2002	0.30	95	13.4	13.4
	30	08.2002	0.55	98	24.6	24.6
Total:			3.81	94.1	1060.0	4843.7

Methane-gas degassing and utilization process flow chart

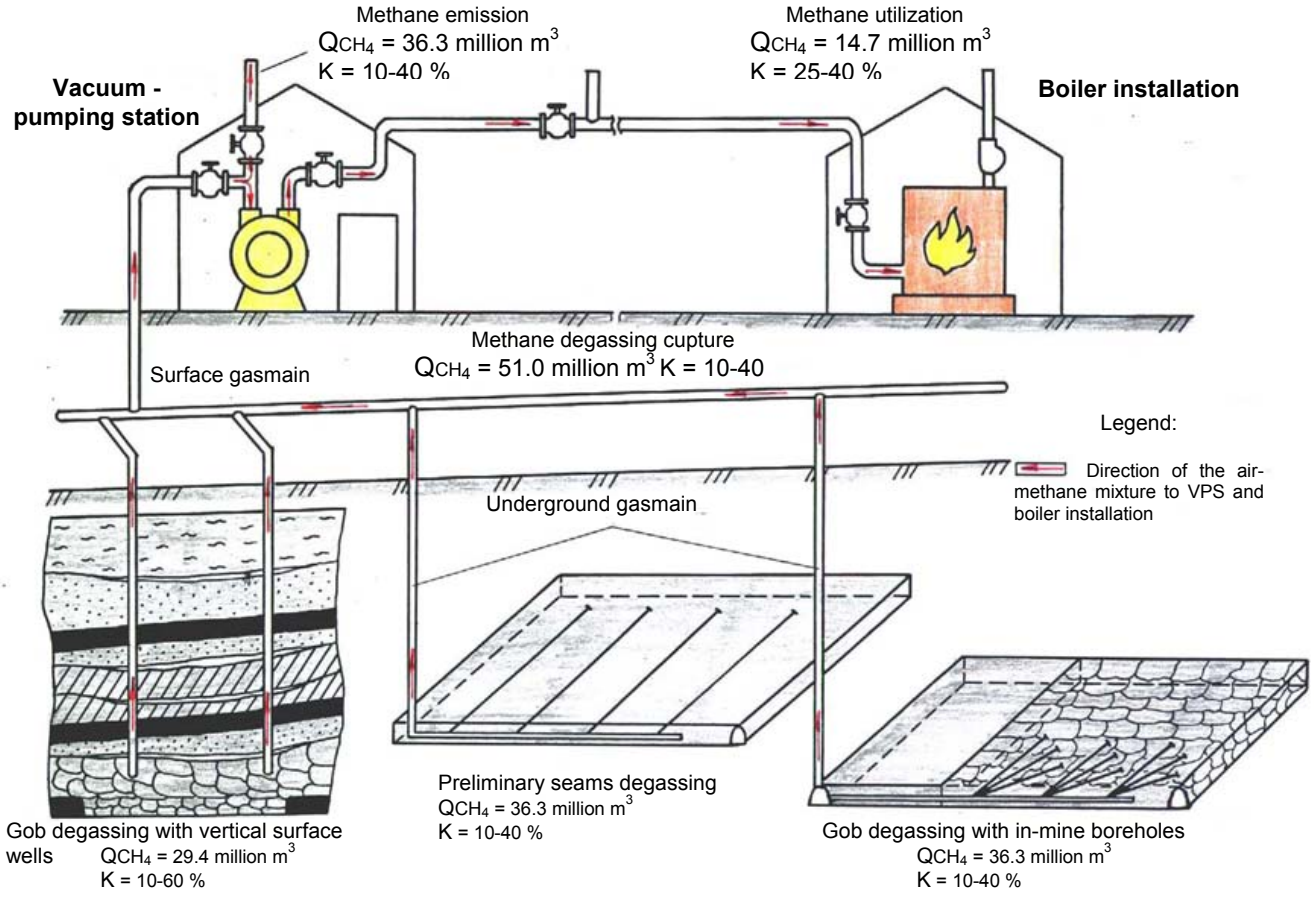

Fig. 1

The Coal Division Program for 2005 plans the growth of in methane degassing and utilization, providing mitigation of emission from 1016 million m^3 in 1992 and 461 million m^3 in 1996 to 253 million m^3 in 2005 (from 14.2 and 6.45 million ton to 3.5 million ton in carbon equivalent).

The main ways of methane emission mitigation in the basin are following:

- optimization of mine ventilation with engineering reasonable reduction of mine in-blown air, with appropriate reduction of the methane recovered from mines and not-connected to mining operations;
- increasing of methane utilization volumes from 15.0 to 75.0 million m^3/year, recovered by traditional methods of degassing and preliminary degassing preparation, due to application of the modern energy-generating equipment, expansion of methane flare application, and production of marketable soot;

The two late methods have the real basis.

In order to methane emission mitigation "Spetzshahtomontagedegazatsyia" has developed a flaring technology for the methane, recovered from the GRP wells at the mines of Shahtinskiy area. Flaring installations of our design have been functioning at 7 – 8 wells since July 2001 and have combusted 1.2 million m^3 of methane, or 17 thousands ton in carbon equivalent. It is planned to expand this methane emission mitigation method application to 12 – 15 wells till 2005, to combust 8.4 million m^3 (117.5 thousands ton in carbon equivalent) for the period from 2001 to 2005.

However, methane flaring does not provide marketable production, so "Spetzshahtomontagedegazatsyia" currently conducts testing of an installation especially designed for production of marketable soot, as a decomposition product of the methane-gas recovered from the GRP wells.

This installation is designed as individual for each well. From the methane flow of 0.4 m^3/minute it can produce 50 kg of soot a day or 15 ton a year, with market price of $ 400 per ton.

Despite the obvious topicality of the problem there is no clearness in Karaganda region on the process of 1997 Kyoto Protocol introduction, and carbon quota market mechanism and our opportunities.

Regarding coal methane emission mitigation issues Coal Division of OJSC "Ispat Karmet" is maintaining contacts with Climate Change Coordination Center (Astana, Kazakhstan), Moscow State Mining University (Moscow, Russia), Environmental Protection Agency (USA), KazSRI of Environmental Monitoring and Climate, Methane Center (Almaty, Kazakhstan), and other environmental institutions.

Currently we are in need of modern coalmine methane production and utilization technologies and equipment, and interested in cooperation with different companies and organizations, potential investors for development of methane emission mitigation projects in Karaganda coal basin.

Annex:

Methane-gas degassing and utilization process flow chart (fig. 1).

"Methane Center"

6, October 2002 INFORMATION BULLETIN

Coalbed methane potential of Kazakhstan

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Coalmining regions of Kazakhstan suffering the lack of oil and natural gas fuel may supply themselves and adjacent areas due to development of local coalbed methane resources. First of all it applies to Karaganda, Astana and Pavlodar oblasts.

Objective prerequisites for commercial CBM production in Karaganda coal basin and other tens of coal-and-gas deposits of Kazakhstan are international experience gained in this area, development of effective CBM recovery and utilization technologies and large methane subsurface reserves of the country, available for profitable production of coalbed methane as independent gas energy resource. Coal-gas production experience of USA, China and other coalmining countries demonstrates application of these high-efficient technologies of coal seams' gas recovery (fracturing, pulse pneumo-hydrodynamic impact on a coal seam in an open bore - cavitation), provides high outputs of production wells (in active well operation period 30-40 thousands m^3/day, in peak period - 60-80 thousands m^3/day and higher). Reduced profit taxation, practicing in all the countries where the given industry is being developed, contributes to increasing of production for a short period.

Thus thanks to the governmental support, appropriate legislation and tax remissions coal methane production in the US had been increased from 5 to 15 billion m^3 a year only from 1990 to 1992, and currently is estimated above 40 billion m^3 a year. It resulted in development at coal basins a specialized new kind of fuel & energy industry.

Russia and Ukraine are following the same way. During recent years supported by international organizations they conducted research of the exact selected coalfields.

For example, in Kemerovo oblast (Russia) was established a new enterprise called "Methane of Kuzbass" – joint initiative of "Gasprom" and local administration. Startup of experimental-industrial production is planned by 2004. Experimental stage of the project supposed to be conducted out of the proceeds of bank credits obtained on a security of "Gasprom". Broad infrastructure development is designed under the project.

Local needs of Karaganda, Pavlodar and Astana oblasts.

Coalbed gas recovered at the mines of the Coal Division of "Ispat Karmet" (out of the mining operation zone) mainly presents methane (up to 98%). The gas does not contain sulphur compounds and other detrimental impurities. So after water separation and odorization this gas may be transferred to consumers. Utilization of this gas is almost the same as utilization of the traditional natural gas for industrial and household needs.

Methane utilization in Karaganda oblast is at the embryonic stage – the gas is combusted in boiler installations of several mines.

There are the following potential consumers in this area: OJSC "Ispat Karmet" metallurgical complex (0.3 billion m^3 a year), heat-and-power stations (1.5-2.5 billion m^3 a year), population of the region (50-60 million m^3 a year), boilers of mines.

Potential consumers in other oblasts are Pavlodar aluminium plant, heat-and-power stations of Pavlodar and Astana, household needs of the population.

Potential coalbed methane resources of Kazakhstan.

CBM resources of Kazakhstan coal deposits, prospective for gas extraction, estimated approximately at 2 trillion m^3, only to the depth of 1800 m. A half of these resources contained in Karaganda coal-and-methane Basins, and 47 billion m^3 – in Ekibastuz Basin. Prospective deposits are meeting the requirements of geotechnical criteria of coal deposits availability for industrial extraction of methane (Table 1).

Table 1

Prospect estimation criteria	Prospect criteria characteristic
A. BY EXPLORATION WORK	
1. Methane content of coal seams	More than 8-10 m^3/ton, with increasing with depth
2. Estimation depth (with modern technologies)	From 300 to 1800 m, most favorable 500 – 1200 m
3. Scale of methane resources	More than 5-10 billion m^3 at the site, deposit
4. Concentration (density) of methane resources	More than 150-200 million m^3/km^2 for production groups of coal seams
5. Coal content of production range	More than 5-10 % in production range (150-200 m) on the mine, i.e. no less 8-10 m of total coal seams thickness
6. Individual thickness of production groups' coal seams	0.7 m and more
7. Ash content of coals	Less than 35 %
8. Petrographic composition of coals	Vitrinitic
9. Grade of metamorphism	Groups G, Zh, K, OS and T with vitrinit reflectance ratio in immersion from 0.6 to 0.2 %. The most promising groups G, Zh, ZhK with vitrinit reflectance ratio from 0.75 to 1.20 %.
10. Fragility and fissuring of coals	Coals of middle metamorphism stages (inter-fissure spacing 0.1 –0.3 sm) are characterized by maximum fragility and endogenous fissuring (predetermining enhanced permeability)
11. Tectonics of deposits, sites, areas	Simple slightly-sloping folds with pitch angles up to 30-40°
12. Geodynamic state of coal-bearing strata	Massifs are in the stretching or slight pressing state
13. Distance from coal/gas fields to consumers	At most 200-250 km

Continuation of Table 1

B. BY RESULTS OF TESTING AND EXPERIMENTAL-INDUSTRIAL OPERATIONS	
1. Permeability of productive groups' seams in natural attitude, in the optimum depth interval	More than 5mD by geological production researches. The highest permeability is peculiar to the coals of average metamorphism stages
2. Existence of increased permeability zones, which contribute to growth of field methane production efficiency with application an efficient technology of "cavitation"	Permeability is more than 10-20mD, where the most successful application of pneumo-hydrodinamic method of coal seams' gas recovery intensification is possible. Existence and location of such zones is forecast with application of geophysical and remote methods. Seams' permeability and wells' production in these zones are determined while testing and experimental-industrial examinations.
3. Technological opportunity for coalbed gas recovery intensification facilities' application	After application of coalbed gas recovery intensification methods (Fracturing, cavitation, electrical action, etc.) while experimental-industrial testing wells' production for the starting of operation period should be no less than 5-10 thousand n^3/day, and while the active operation period on average about 20-40 thousand m^3/day.
4. Environmental necessity for reduction of pollutants' content in the air	Is predetermined by the current level of pollutants' content in the air of coalmining regions
5. Economic profitability of large-scale methane production at the estimated lands and transportation to the consumers	Is determined after experimental-industrial testing based on the analysis of profitability of coalbed methane production development at the estimated lands

Calculations, conducted by local specialists, demonstrate that no less than 150-200 million m^3/km^2 methane resources concentration in coal seams in required for profitable commercial methane production. The majority of coal deposits in Karaganda and Ekibastuz basins are significantly exceed this characteristic. For example, the density of methane resources in Karaganda basin varies over the range of 400-700 million m^3/km^2, and in Ekibastux - 1300-3100 million m^3/km^2.

Large methane resources of numerous but still understudied coal deposits of North and East Kazakhstan are huge reserves for development in the future.

These resources will provide opportunities in Kazakhstan for large-scale production of methane as an independent mineral wealth.

First priority objects for coal and gas production.

Areas, sites and deposits priority for coal methane production were selected according to the prospective criteria and considering their geological structure.

Some lands of Karaganda basin, central part of Ekibastuz basin and some other well-studied deposits are the most favorable for methane production. It doesn't raise doubts that coal seams, and most likely the bearing strata have rather good gas recovery and gas permeability, though these features are displayed only by indirect characteristics: high gas-content of coal mines, sudden coal and gas bursts, up to 50% gas emission from the coal core without forced degassing, and experience of preliminary coal seams degassing with currently operating vertical wells, drilled from the surface. We inclined to refer the minor output of these wells to imperfection of equipment and technology currently used in Karaganda basin.

As first priority commercial methane extraction objects' preparation areas in Karaganda basin were determined Tentekskaya trough and deep horizons of Saranskiy area, and Ekibastuz coal basin. Used parameters leading to the first priority are: detailed area exploration and studied coal seams gas content; compliance to all the requirements for commercial methane extraction; existing top horizons' degassing operations experience and its positive results.

Second priority objects are Dubovskiy and Taldykudukskiy sites, and deep horizons of Churubainurinskiy area.

Two deposits are seen as reserve objects – Samarskoye and Zavjalovskoye. Coal seams of these deposits pertain to the same coal-bearing strata, that coals of Karaganda basin do. Furthermore, reserve sites may also be determined in Karaganda basin (Table 2).

Karaganda and Ekibastuz basins are undoubtedly the most prospective huge objects for development of coal and coalbed methane production.

Karaganda basin elongated for 120 km in latitudinal direction with average width of 30 km. Carbon coal-bearing-measures occupy the land of about 2000 km^2. Three synclines are notable in the basin: Churubainurinskaya, Karagandinskaya and Verhnesokurskaya. The two firsts have commercial significance for coal production. The basin consists of 65 coal seams. The majority of them have thickness above 1 m, and 7 – from 3.5 to 8 m.

Vitrinit prevails in compositions of the coals (57-85 %), ash content vary from 10 to 35%, the most widely-spread are coals of types from Zh to OS with vitrinit reflecting capacity of 0.8-1.02 %. Generally through the basin this index does not exceed 1.75 %.

Synclines are proved till the depth of 700 m, and at the Tentekskiy, Churubainurinskiy and Saranskiy fields - till 1300-1400 m. Gas content of coal seams and bearing strata is proved till the same depths. The rest land of the basin is prospected.

The depth of methane zone surface in the basin varies in the range of 60-250 m and depends on the coals' metamorphism grade and geological structure of the fields. Methane content of seams rises sharply with the deepening from the methane zone surface to 400-500 m (from 0 to 15-20 m^3 per ton of dry ash-free basis), then the growth rate sharply decreases, and at the depth of 900-1800 m it amounts 25-30 m^3 per ton of dry ash-free basis.

Average concentration (density) of methane resources in Karaganda basin estimated at 275 million m^3/km^2, and in the series of prospecting sites - 400-700 million m^3/km^2.

Tentekskaya trough is characterized with such density of coalbed methane resources (0.5 billion m^3/km^2). It is the deepest synclinal fold of the basin and 150-km^2 area containing 13 workable seams with thickness from 1 to 7 m, gas content of 10-30 m^3/t a.f.b., and 20.7 billion m^3 of methane resources at the depths from 700 m to 1300-1400m.

Table 2

Basin, deposit, field	Coal reserves, million ton	Methane capacity m^3/t	Methane reserves, billion m^3	Density of methane reserves, billion m^3/km^2
1	2	3	4	5
Karaganda basin		10-30	~1000	0,28-0.7
Fist-priority objects				
Tentekskaya mold	1200,4	10-30	20,7	0,5
Deep horizons of Saranskiy field	3000	22-27	60	0,7
Second-priority objects				
Dubovkiy field	600	24-28	10.2	0.5
Deep horizons of Churubainurinskiy area	2327	24-27	55.4	0.4
Taldykudukskiy field	1800	10-30	36,4	0.6
Fist-priority object				
Ekibastuz coal basin (seams 1,2,3)	4800	14-20	47	1,3-3,1
Other objects				
Zavyalovskoye	529	17	14.6	0.03
Samarskoye	1300	25	26.0	0,12
Nurinskoye	491	12	5,9	0,17
Akzhar	421	15	3.4	0.1 1
Teniz-Korzhunkolskiy basin	2600	25	45.0	0.26
Koitas	452	12	5.4	0,08

Deep horizons of Saranskiy field – 46-km^2 area selected in north-west part of the Karaganda syncline at the depths from 700 to 1300m, the seams lie slightly slope - 5-20° and monoclinally. Disjunctive breaches are not numerous. 17 seams from 19 have thickness above 0.7m. Total thickness of their coal mass is 31m. Two productive intervals are marked out: upper – 200m includes the seams K_{17}-K_{10} with 14m coal mass thickness, and lower – 110m, including seams K_7-K_1 with 14.6 m coal mass. Average coal ash content of seams K_{15}-K_5 - 22%, K_4-K_1 - 30%, vitrinit reflecting capacity is 1-1.3 %. Methane content of the upper group seams - 22-25m^3/t, lower - 23-27 m^3/t. Methane resources ~ 31-35 billion m^3.

Ekibastuz basin is unique for its coal concentration: 9.8 billion ton of coal concentrated at the 77-km^2 area of coal-bearing strata. Industrial coal content of the basin is determined by the seams 1,2,3, belonging to Ekibastuz strata series. The seam 4 is not mined, but has rather high gas content. Total thickness of all the four seams is 146-170 m, and coal mass - 100-142 m. Coals are of the average grade of metamorphism (R° - 0.85-1.15%), their ash content is 29-50%. Gas weathering zone is traced to the depths of 70-225 m and depends on inclination of the coal seams. From the depth of 400m, where commercial methane production may be started, to the center of the rough – 700m methane content of the seams rise from 14 to 20 m^3/t a.f.b. Coal reserves at this area estimated at 4.8 billion ton (2.6 billion ton a.f.b.), methane resources – 47.5 billion m^3, and density of the resources – 1.3-3 billion m^3/km^2.

Ekibastuz basin exceeds all the measured prospective criteria except ash content (basically 30-40 %), which may negatively influence to the gas recovery. However, the thickness of coal mass (up to 150 m) of the basin, shallow seams and significant methane content must provide high profitability of the methane production.

The second priority objects, recommended for methane production, are Dubovkiy, Taldykudukskiy fields and deep horizons of Churubainurinskiy area.

Dubovkiy field is continuation of Saranskiy field deep horizons' inclination and located at the depths of 1300-1500m. Its study is at the exploration stage. According the data seams retain the same thickness, ash content and petrographic composition as ones of the deep horizons of Saranskiy field. Only metamorphism grade increases - OS (R°- 1.15-1.5 %) and methane content of the seams rises for 1-1.5 m^3/t a.f.b.

Taldykudukskiy field has rather complex tectonic pattern due to the adjacency to Zhalairkiy thrust.

Taldykudukskiy trough with slightly slope northern and steep (70-80°) southern extensions located at the middle part of the field. Coal-bearing deposition of the field represented by a whole cut of Karaganda strata series with 20 seams with working thickness from 0.8 to 6.3 m, coal mass content 0.7-5.7 m and its total thickness – 41m. Ash content of the coal does not exceed 23 %, type composition comply with Zh, OS (R_0 - 1.15-1.4 %).

Methane zone begins at the depth of 200 m, methane content in the interval from 200 to 700 m rises from 0 to 23-24 m^3/t a.f.b., and at the depth of 1800 m runs up to 30 m^3/t a.f.b.

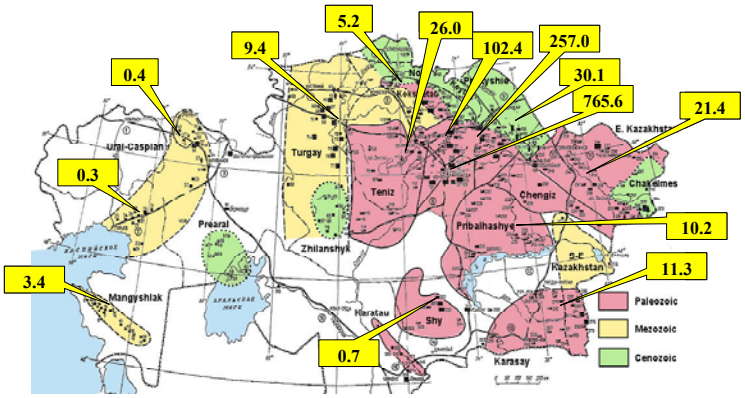
Coal reserves of Taldykudukskiy field to the depth of 1800 m amount 1.8 billion ton, methane resources comes to 55 billion m^3, density of the resources in 0.6 billion m^3/km^2.

Deep horizons of Churubainurinskiy area are marked out in the central part of northeast extension of the same-name syncline at the depths from 700 to 1500 m, where the coal seams lie calmly, monoclinally with inclinations of 10-20°. Disjunctive breaches are rare.

This coal-bearing strata is represented by Karaganda strata series seams with coal mass content from 0.7 до 3.8 m in the individual seams, total thickness is 33.6 m. Average ash content of the coal is no less than 25 %, R_0 – 1.15 –1.75 %, methane content varies from 24 to 27 m^3/t a.f.b., methane resources ~ 55.4 billion m^3. At the rest land of Karaganda basin there may be marked out 4-6 more objects of third-priority at the minimum. Later on some other deposits of the basin may be developed (Table 2). The depth of recovery may be increased from 1,800 to 2,500-3,000m in Karaganda basin and deposits of Permian and Jurassic age.

Thus methane production may last for decades.

Kazakhstan - Coal Methane Reserves



Coal Methane Reserves (billion.cub.m)

Step-by-step scheme of methane production development at the selected fields

Commercial development of coal-methane deposits is implemented in three stages:

- First stage – geological exploration, including survey of geological materials, subsurface methane resources estimation, gas recovery and coal strata gas capacity determination based on the core samples, seismic operations (exploratory stage);
- Second stage - experimental-industrial (testing stage) including pilot wells drilling, selection of the most effective technology for methane extraction, at positive results go on to the
- Third stage– commercial methane production (operating stage).

The fields of 1, 2 and 3 priority (Table 2) may provide profitable methane production even when well production capacity is 10,000 m^3/day that proved by the scale and density of methane resources (calculations of profitability conducted by "Spetsshahtomontagedegazatsiya", Coal Division of OJSC "Ispat Karmet").

Amount of investment and terms of repayment

The possibility of CBM production depends on the exploration and testing stages. These stages may be conducted only at the expense of attracted investments.

According to the experience gained in many countries it requires no less than $15-20 million. In case of positive results commercial production will be mainly financed due to gas sales and attraction of minimal investments for the beginning stage of commercial production development. Payment of loans must be started in 4-5 years, and repayment of credits will be completed in 8-9 years. If case of 2-3-times higher well outputs (20-30 thousand m^3/day) repayment may be completed in 3-4 years, and following 10-12 years of active wells' operation will yield profit and provide further development of methane production.

Topicality of coal methane projects in Kazakhstan and obstacles for the implementation

As, once in the atmosphere, coal methane becomes a greenhouse gas, potent in contribution to the climate change, emission mitigation is a responsibility of Kazakhstan under the UN Framework Convention on Climate Change (UNFCCC). Besides, Kazakhstan participation in Addendum 1 of the Kyoto Protocol, after enforcement and ratification, provides the Republic with opportunity of active participation in the market mechanism of the Protocol. Globally it doesn't matter where greenhouse gas emission is mitigated exactly. It is more efficient to reduce emission where it's cheaper to introduce modern environment–friendly technologies.

Energy resources and environmental situation in coalmining regions of Kazakhstan also emphasize topicality of the issue. For example in recent years owing to the flow of investments assigned for the new capital of the country, Astana has undergone an extensive development in terms of growing construction activity and improvements in the city infrastructure. However, social and economic development of the city is considerably restrained by a lack of energy resources. Because of being far from oil & gas fields of West Kazakhstan, Astana has to import liquefied gas from Russia. At the same time the city is very close to coal deposits containing huge reserves of coalbed methane comparable with traditional natural gas deposits. This methane can be used in Astana oblast and other coalmining regions of Central and Eastern Kazakhstan as a cheap and environment-friendly fuel.

However such projects require serious investments, removing of definite law, information and organizational obstacles is necessary for attracting. One of the main obstacles is absence of exact specific data on evaluation of emission and potential CBM reserves estimation for definite deposits based on the applied exploration with modern methods and technologies. Unfortunately Republican legislation on subsurface resources utilization still does not encourage such kind of activities. There is a lack of information distribution in professional environment regarding environmental aspects of the issue, shortage of investment funds for coal methane projects and deficiency of qualified specialists. With the aim of overcoming mentioned and other factors, impeding the process of methane projects development, basing on the experience of leading coal mining countries, Methane Center has developed a draft of the State Program Concept "Exploration, extraction and utilization of coalbed methane in Kazakhstan for 2001 –2010".

Current development and prospect plans

Currently degassing is currying out mostly on mines of the Coal Division of Ispat-Karmet, the biggest coal mining company operating in the Central Kazakhstan. Different methods of methane emission mitigation by ventilation and sems' preliminary degassing treatment are used at mines of the enterprises. Captured methane is used as fuel for boiler installations of the mines. However, commercial production is not conducted. Traditional research studies, conducted for coal fields' mining preparation are insufficient now. Additional coal-gas recovery characteristics should be obtained in order to select first-priority objects, and location of pilot wells for development of coal-gas production as a new fuel and energy industry.

High-accuracy surface geology-geophysical methods are significant at this stage. Coupled with well data they allow creation of a detailed 3D model of geological structure and predicting most prospective gas recovery zones.

Research works related to these issues, search and study of modern progressive exploration, extraction and utilization technologies are currently conducted by OJSC Azimut Energy Services and specialists of the Methane Center.

Evaluation of coal methane as an independent mineral wealth allows revising traditional approach to development of coal deposits, which may be previously developed as methane deposits. These resources of coalmining regions of the country potentially may be used as a local clean alternative gas fuel.

Geology and Subsurface Protection Committee of the Ministry of Energy and Mineral Resources of Kazakhstan by the Memorandum, dated March 1, 2002, denoted coalbed methane extraction and utilization in Kazakhstan as one of the significant and priority issues. The Committee made the decision to provide all possible support to any part, private company, governmental body, NGO or international organization, which would be interested in coal methane development projects in Kazakhstan.

RESOLUTION
of the First Coal Methane Workshop in Kazakhstan

The first workshop dedicated to coal methane issues in Kazakhstan was held in Almaty in September 12, 2002.

The workshop was initiated and conducted by the Methane Center with expressed approval of the Ministry of Energy and Mineral Resources of Kazakhstan.

The workshop was organized by: "Iteca" exhibition organizing company, Methane Center NGO and Kazakhstan Academy of Mineral Resources with support of the Committee of Geology and Subsurface Protection of the Ministry of Energy and Mineral Resources of Kazakhstan and Government of Karaganda oblast.

Following governmental agencies of Kazakhstan, NGOs and private companies participated in the workshop: Ministry of Energy and Mineral Resources, Committee of Geology and Subsurface Protection of the MEMR, the Minstry of Environmental Protection, OJSC Azimut Energy Services, Coal Division of OJSC Ispat-Karmet, Bogatyr Access Komir Llp. A representative of the US Environmental Protection Agency, Ms. Katherine Buckley, participated in the event by invitation of Mr. Shkolnik, the Minister of Energy and Mineral Resources of Kazakhstan.

Having listened and discussed the report presentations made the workshop must NOTE:

- Coalbed methane is one of the potent greenhouse gases. More than 1 billion cubic meters of methane are emitted to the atmosphere annually while development of coal deposits in Karaganda and Ekibastuz basins.
- Methane – is the main danger for underground coal mining. Explosions of methane take place in different mines of the world. Every time they take tens of lives and cause sufficient economic damage to coal mining enterprises. Because of the deepening of coalmining development in Karaganda and Ekibastuz methane emission in the country constantly increases facing much explosive risk while underground mining.
- Gas content level of coal deposits significantly affects economic indexes of coalmining enterprises. Decreasing of nature coals' gas content by advance recovery and utilization of methane will sharply reduce net cost of underground coalmining.
- Environmental situation remains unfavorable in industrial regions of Kazakhstan – Center and East, where the main energy resource is coal. Greenhouse gas emission per capita in Kazakhstan is 2-8 times higher than the same indicators in other countries of Central Asia (Uzbekistan and Kyrgyzstan correspondingly). Coalbed methane is one of the most real and prospecting of non-traditional, ecology-friendly energy resource.
- Coalbed methane recovery and utilization projects are being developed throughout the world for the last two decades. The most successful ones may be seen in the USA, United Kingdom and Germany operating on the stage of commercial methane production. Up to 40 billion cubic meters of methane are recovered and utilized in the United States annually. Among developing countries similar projects put into implementation in China and India. Ukraine and Russia also came closely to the commercial production stage.
- As shown by international experience, development of coal methane recovery and utilization projects obtains governmental support in the form of tax remissions for the first 5-10 years with the purpose of attracting investment. Tax reduction is up to 50-100%.
- Kazakhstan has considerable reserves of coalbed methane and appears as one of the first ten countries in the world by its volume. Methane reserves of Kazakhstan coal fields amount more than 1 trillion cubic meters. Gas content of Karaganda and Ekibastuz basins' coals has been studied rather well.
- There is some certain experience of methane recovery in Kazakhstan. Degassing operations in Karaganda basin has been conducting with surface boreholes for more than 30 years.
- Kazakhstan has significant scientific and industrial potential available for development of coalbed methane recovery and utilization projects.

Having discussed the issues of Kazakhstani coalbed methane, the workshop is RECOMMENDING:

- The Methane Center to prepare Program for development of coal methane recovery and utilization projects in Kazakhstan in accordance with the "Rules for Programs' Development in the Republic of Kazakhstan", approved by the Decree of the Government of the RK # 789 dated May 25, 2000. Draft of the Program for submission to the Government of the Republic of Kazakhstan should be prepared in a short time.
- To involve participants of the Workshop: representatives of governmental agencies, scientific and industrial organizations, commercial companies interested in development of coalbed methane extraction and utilization projects, in preparation of the Program.
- To charge the Solid Fuel Office of the Ministry of Energy and Mineral Resources of Kazakhstan for consultation assistance and contribution in development, co-ordination and approval of the Coal Methane Program.

Participants of the workshop hope the implementation of the Program besides economic effect will contribute to improvement of environmental and social situation in industrial regions of the country.

The resolution accepted unanimously.
Chairman of the workshop

Prof. G.R. Bekzhanov
President
Kazakhstan Academy of Mineral Resources

The list of participants of the Coal Methane Workshop, conducted by the Methane Center in collaboration with "Iteca" in the framework of KAZMIN/KAZMET-2002 conference, September 12, 2002.

1. Prof. Ginayat Bekzhanov, President, Academy of Mineral Resources of the RK
2. Ertysbai Aliev, Head of the Solid Fuel Office of the Ministry of Energy and Mineral Resources of Kazakhstan
3. Katharine Buckley, Climate Programs Manager, United States Environmental Protection Agency
4. Evgeny Ryaskov, Ministry of Energy and Mineral Resources of Kazakhstan
5. Wicher J. Slagter, Counsellor, Deputy Head of Mission, Royal Netherlands Embassy in Kazakhstan
6. Roza Zainutdinova, Commercial Assistant, Royal Netherlands Embassy in Kazakhstan
7. Valeriy Stratov, Deputy Technical Director, Prospects & Design, "Bogatyr Access Komir" LLP
8. Bulat Uzhkenov, Chairman of the Committee of Geology and Subsurface Protection, Ministry of Energy and Mineral Resources of Kazakhstan
9. Irina Iserkepova , Kazakhstan Scientific and Research Institute of Environmental Monitoring and Climate
10. Igor Perkov, First Deputy Chairman of the Board, OJSC "Azimut Energy Services"
11. Igor Shvetz, Department "Spetzshahtomontagedegazatsiya", Coal Division of OJSC "Ispat-Karmet"
12. Alexander Shipulin, Department "Spetzshahtomontagedegazatsiya", Coal Division of OJSC "Ispat-Karmet"
13. Tursun Baimukhametov, Department "Spetzshahtomontagedegazatsiya", Coal Division of OJSC "Ispat-Karmet"
14. Rakhat Mustafin, Director, Methane Center
15. Representatives of other interested organizations.

G.R. Bekzhanov, President, Kazakhstan AMR, Chairman of the Workshop (left) and B.S. Uzhkenov, Chairman of the Committee of Geology and Subsurface Protection, *ME & MR*

Central Asian Mining and Metallurgy Conference KAZMIN/KAZMET-2002

April 15-17, 2003
Republic of Kazakhstan,
Atyrau city
Atyrau Sport Complex

2nd North-Caspian Regional Exhibition "Oil & Gas"

The main sections of the exhibition:

- Production and processing of oil and gas
- Oil and gas equipment
- Oil and gas transportation/other transportation services/logistics
- Geophysics services
- Environmental protection and safety
- Project research/design/construction
- Engineering and consulting services
- Service support of oil and gas fields
- Individual and industrial protection products
- Software

For more information contact Iteca
Tel. +7 (3272) 583429 / 34
e-mail: oil-gas@iteca.kz
Contact person:
Saule Astanova,
Project Manager

Dear readers!

Taking an opportunity to remind you, that activities of the Methane Center are based on the voluntary participation of governmental and commercial organizations, NGOs and individuals in development and implementation of joint projects related to coal methane research, recovery and utilization as an alternative, environment-friendly energy resource, on donor or commercial basis.

We hope that aims and objectives of our organization are completely or partially meet your interests. In this case we are always ready to discuss possible ways of cooperation.

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Fax: 3272-596650
E-mail: kazmethane@azimut.kz

Methane Center

Coalbed Methane:
Business Development Opportunities in Russia
International Workshop

Kemerovo, Russia
March 17-19, 2003

On 17-19 March 2003 the International Workshop Coalbed Methane: Business Development Opportunities in Russia will be held in Kemerovo, capital of the largest coal mining region in Russia. This event is devoted to the actual problems of coalbed/coalmine methane recovery and utilization development in the Russian Federation. The following items will be considered on the workshop:

- Investment opportunities for the coalbed/coalmine methane projects development in Russia;
- Institutional and economic considerations for the commercialization of coal mine methane in Russia;
- Geology of coal-gas deposits;
- Technical options for coalbed/coalmine methane recovery and utilization.

The Round Table will follow the overview session where participants will have opportunities to discuss cooperation between
western investors, oil, gas and coal companies and Russian counterparts for the commercial development of coalbed/
coalmine methane in Russia.
The participants of the workshop will also have the opportunity to visit coalbed methane wellbore drilling sites.

Contact Address
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2003 CALENDAR OF THE MAIN EVENTS

2003 International Coalbed Methane Symposium
May 5-9, 2003, Tuscaloosa, Alabama, USA
The submission deadline has been extended to September 30, 2002. Notification of the abstracts' acceptance/non-acceptance status will be sent/faxed to corresponding authors by October 31, 2002. The deadline for submitting camera-ready, electronic manuscripts for accepted papers is January 31, 2003
The Symposium is held every two years and attracts a technically and geographically diverse audience. It is generally the largest international event in the field of coalbed methane and offers paper sessions, workshops, short courses and field trips. At the Symposium, the EPA hosts a half-day workshop focused on international issues. For more information mail to Nova Hodo: nhodo@ccs.ua.edu.

International Workshop "Coalbed Methane: Business Development Opportunities in Russia"
Kemerovo, Russia, March 17-19, 2003
All the information may be found at: www.uglemetan.ru or requested by mailing to: mail@uglemetan.ru

3rd International Methane & Nitrous Oxide Mitigation Conference
Beijing, China , September 14-19, 2003
Join participants from throughout the world to share experiences in developing innovative, project-oriented solutions to the problem of methane and related nitrous oxide emissions.
The conference Call for Papers was released in November 2002, and all interested parties are encouraged to submit abstracts. Details, including guidelines for abstracts and papers and dates for submission may be found at:
http://www.ergweb.com/methane_china/call_for_papers.htm.
General information on the conference:
http://www.ergweb.com/methane_china/.